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ABSTRACT

The purpose of this study was to evaluate the effects of sequential visual-motor skills, developed as described in "Visual Motor Development" (VMD), on the reading achievement of children enrolled in a remedial reading program in a San Antonio elementary school. Data were obtained from 52 children in first through sixth grades divided evenly into an experimental and a control group. Subjects in both groups received individually prescribed programs of remedial reading, with only the experimental group receiving additional daily fifteen-minute instruction and practice in VMD activities. Findings after eight months of instruction showed that the VMD Program in this study did not significantly affect either reading achievement among remedial reading pupils or the visual-motor skills assessed by tasks rated on the Motor Coordination Rating Scale. However, the remedial reading procedures used with both groups were effective, producing statistically significant t-values. (JM)

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A STATISTICAL EVALUATION OF HEINSEN'S VISUAL MOTOR DEVELOPMENT PROGRAM AND ITS EFFECTS UPON THE READING ACHIEVEMENT OF A GROUP OF DISABLED READERS

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A REPORT OF RESEARCH

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A STATISTICAL EVALUATION OF HEINSEN'S VISUAL MOTOR DEVELOPMENT PROGRAM AND ITS EFFECTS UPON THE READING ACHIEVEMENT OF A GROUP OF DISABLED READERS

REVIEW OF THE LITERATURE

Reading is a complex process involving, among other factors, the sensory system of the learner, his perceptual skills, and the operation of his central nervous system. Abrams (1968) says that teachers should be alerted to a multiplicity of factors operating in a given child-learner, with particular attention focused on the "whole child" and his ability to cope with the learning situation. This multiplicity may include social, cultural, psychological factors, and one of these factors is visual perception.

Visual perception is more than a properly functioning optical system; it includes visual interaction with all the senses and movement systems of the body. Gregory (1966) says:

> The eye is often described as like a camera, but it is the quite uncameralike features of perception which are most interesting. . . . What the eyes do is feed the brain with information coded into neural activity--chains of electrical impulses--which by the code and the patterns of brain activity represent objects. . . .
>
> The seeing of objects involves many sources of information beyond those meeting the eye when we look at an object. It generally involves knowledge of the object derived from previous experience, and this experience is not limited to vision but may include the other senses: touch, taste, smell, hearing and perhaps temperature or pain. . . . Perception is not determined simply by the stimulus patterns; rather it is a dynamic searching for the best interpretation of available data (pp. 7, 8, 11).

The eyes are part of a specialized optical system with each part of the system making its contribution in translating patterns of light into

neural pulses channeled to the cortex for recognition, integration, and storage(Gregory, 1966).

Fantz (1963) reports that the human organism begins responding to and processing visual data almost immediately following birth. During this processing, there is a considerable amount of modification of the retinal images and interpretation by the cortex; otherwise vision would be chaotic and useless (Leibowitz, 1965). To explain the procedures by which the retina, central nervous system, and cortex process visual data, Kabrisky (1966) draws an analogy between the human visual system and a computer programed for pattern recognition. He describes the human visual system as a "two-dimensional-pattern-manipulator" capable of "cross-correlation," and states that both the computer and human brain require "programing" or prior experience with a given pattern if recognition of a stimulus pattern is to be accurate.

Vision, then, appears to be learned through experience, particularly experience based upon movement and the matching of movement with visual data (Forrest, 1969; Kabrisky, 1966; Kephart, 1966). In this vein, vision specialists have long urged teachers to recognize that efficient vision is more than mere 20/20 acuity (Anapolle, 1971; Brod and Hamilton, 1971; Eames, 1962; Flax, 1968).

Forrest, an optometrist, says:

> Vision involves a process that includes all the mechanisms that fulfill the requirements of getting knowledge. . .it interacts with all the senses, all neural elements, and all movement systems. . . .Only thus do we develop the ability to get meaning from visual symbols (p. 38).

On the other hand, the literature reveals apparently conflicting data on the relationship between visual perception and reading achievement (Cohen, 1969; Gibson, 1975; Hammill, 1972; Morgan, 1968). However, visual

perception is reported to be an important factor in the tasks specifically associated with beginning reading; such beginning reading tasks as visual discrimination, visual closure, and visual form perception are found to be highly related to reading (Ames and Walker, 1964; Benger, 1968; Gates, 1922; Scott, 1970; Shipp and Loudon, 1964).

Vernon (1966), British author and researcher, says that young children often use a hit-or-miss manner of scanning the visual field and are unable to perceive accurately the small details of shape, differentiating one letter or word from another. She also says that children suffering from a maturational lag in visual perception frequently become reading diaabliity cases.

Bond and Tinker (1967) concur, saying:

> . . .Numerous investigations reveal a greater incidence of ocular defects among reading disability cases than among good readers or unselected pupils. . . .Optimum conditions for learning to read do require comfortable and efficient vision (p. 107).

When separated from good readers and studied as a group, poor readers are found to have more visual defects than good readers (Betts, 1957; Brod and Hamilton, 1971; Dearborn and Anderson, 1938; Eames, 1962; Huelsman, 1958; Robinson and Huelsman, 1953; Selzer, 1933).

If efficient vision is learned through experience in which the learner matches body movement with visual data, and if poor readers as a group seem to have more visual perceptual defects than do good readers, then one might conclude that visual perceptual training might prevent or ameliorate reading problems thought to be related to visual perceptual deficits.

Morgan reports a study of 80 elementary school children who were referred to school psychologists because of poor academic achievement. The subjects were divided into X and Y groups where the X group was given extensive vision training by three optometrists. Using Chi squared to treat

the data, Morgan reports a statistically significant ($p > .05$) change in the following: reduction of headaches, improved self-concept, improved reading comprehension, improved memory for five-digit sequences, reduction in misperception of rotated letters, increased eye-hand coordination, and increased general scholastic performance (1969).

Rohr reports a study in which children who scored in the lowest decile on certain geometric figure drawing tests were provided with training in both gross motor and fine motor activities, in auditory perception, and in critical thinking. After nine months of training, test results led Rohr to conclude: ". . .It appears that perceptual training is an asset to some underachievers in elementary school" (1969)

Other researchers (Faustman, 1968; Shearer, 1970, Swanson, 1972; Wheelock, 1968) report that some types of visual performance are amenable to improvement, that vision training, based on body movement and the integration of sensorimotor data, can increase readiness for learning or enhance academic achievement for some children.

Classroom teachers have turned to specialists in movement or visual perception for methods and activities which might help some children develop better visual perceptual skills. Several programs are widely used for such purposes: Barsch's Moviegenic Curriculum (McCarthy, 1969), the Leavell Hand-Eye Coordination and Language Training Series, the Kolson-Kaluger Method, the Maria Montesorri Method, the G.N. Getman Method, the Marianne Frostig procedures (Kaluger and Kolson, 1969), and the Newell C. Kephart program (Kephart, 1966).

In this same tradition, a California optometrist, Dr. Arthur C. Heinsen, Jr., has designed Visual Motor Development (Palo Alto, California: Learning Opportunities, 1973), a self-instructional program for teachers which provides a rationale and explicit directions on how to conduct certain visual-motor

activities with children. Housed in a plastic three-ring notebook, the VMD consists of seven tape cassettes and an 89-page manual of directions, some of which include photographs and drawings.

The VMD is based upon a hierarchy of motor and visual skills. The manual and taped instructions urge teachers to have children complete each step satisfactorily before progressing to the next level. The tasks include such motor activities as creeping, using a balance board and a walking board, playing hopscotch, hitting a ball, jumping rope, and drawing on a chalkboard. Each motor activity is conjoined with specific visual tasks, following the philosophical hierarchy.

Several claims are made in the taped portion of the VMD; in one of them, Heinsen says that if faithfully followed in training children, the activities ". . .will improve their (children's) performance in the classroom and help them live a more effective and happier life." The publisher does not provide any research and development data as evidence to support the claims; consequently, this study was undertaken.

THE STUDY

The purpose of this study was to evaluate the effects of sequential visual-motor skills, developed as described in Visual Motor Development, on the reading achievement of a group of children enrolled in a remedial reading program at Park Village Elementary School, San Antonio, Texas, during the school year of 1974-1975.

The Problems

There were two problems to which answers were sought:

1. Do the sequential visual-motor skills developed as described in Visual Motor Development affect the reading achievement of elementary school pupils who are disabled readers?

2. Are visual-motor skills improved by the activities advocated and described in Visual Motor Development?

Substantive and Statistical Hypotheses

In this study, the following null hypotheses were held:

1. There is no significant mean difference between the reading achievement test scores of a group of pupils using the Heinsen Visual Motor Development procedures when compared with the reading achievement test scores of a control group.

$H_0 : M_1 = M_2$ is rejected with an α of .05

$H_1 : M_1 \neq M_2$ is accepted with an α of .05

2. There is no significant mean difference between pre-and post-test Motor Coordination Rating Scale scores achieved by a group of pupils given daily training in Heinsen's Visual Motor Development activities.

$H_0 : M_1 = M_2$ is rejected with an α of .05

$H_2 : M_1 \neq M_2$ is accepted with an α of .05

The Design and Procedures of the Study

The data for the study were gathered at Park Village Elementary School in Judson Independent School District in San Antonio, Texas, during the school year of 1974-1975. Sixty-three children, from grades one through six, were referred to the school's reading teacher for remedial instruction. Using a table of random digits, the researcher assigned the subjects to X (experimental) and Y (control) groups. There was some attrition, but it occurred evenly in both groups, so there were 52 subjects in the study, 26 in each group. The subjects ranged in age from 81 to 143 months; there was a range of intelligence from 72 to 110. There were more boys than girls in both groups. (See Tables I and II for data on the subjects.)

Insert Table I here

Insert Table II here

The socio-economic setting of the school was middle class, and about 20 percent of the subjects in both groups had Spanish surnames. No subject had an obvious physical or visual handicap; that is, no subject was physically disabled or sightless.

All tests were administered by the same individual, the reading teacher, who had a major in physical education and was, at the time of the study, enrolled in the graduate program of the Reading Education Department at Southwest Texas State University.

Intelligence scores were obtained by individual administration of the Slosson Intelligence Test. Motor skills were pre- and post-tested by means of tasks assessed according to an original Motor Coordiantion Rating Scale designed by the researcher (see attached form). Reading achievement was pre- and post-tested by means of the Gates-McGinitie Reading Achievement Tests, forms Primary, Primary CS, and Survey D.

The motor and visual skills advocated and described in VMD were taught precisely as described, with the exception of the amount of time advocated. The taped instructions state that the VMD program should be used approximately an hour each day. However, this was not possible in the study; instead, only fifteen minutes daily could be allocated to the specific VMD procedures, by edict of the school's principal. This brief amount of time is the major limitation of the study. Each child followed the same procedures in the order given; however, each child was required to master a particular level before he advanced, so some children did not complete the entire program because they progressed slowly.

Subjects in both groups received individually prescribed programs of remedial reading, but only subjects in the X group received daily fifteen-minute instruction and practice in the VMD activities.

The Findings

After eight months of instruction in visual-motor skills and remedial reading, the subjects' scores from pre- and post-testing were statistically analyzed, using a computer and programs tailored to these specific data.

The t-tests of mean difference for both visual-motor skills and reading achievement yielded values which were not significant ($p < .05$). Both null hypotheses were not rejected.

1. There was no significant mean difference between reading achievement test scores of a group of pupils using the Heinsen VMD prodedures when compared with the reading achievement test scores of a control group.

2. There was no significant mean difference between pre- and post-test Motor Coordination Rating Scale scores achieved by a group of pupils given daily training in Heinsen's VMD activities.

However, an interesting fact emerged from the data: the mean differences between pre- and post-test reading achievement test scores for both the experimental and control groups were significant beyond the .001 level of confidence.

Conclusions and Implications

Heinsen's Visual Motor Development program, as conducted in this study, did not significantly affect reading achievement among remedial reading pupils in an elementary school. Nor did the VMD procedures produce significant change in the visual-motor skills assessed by tasks rated on the Motor Coordination Rating Scale. However, the remedial reading procedures used with each child in both X and Y groups were effective and produced t-values which were statistically significant.

In view of the findings of this study, it would appear that in a school setting where there is limited time for remedial reading procedures, that pupils can profit from an individually designed program of remedial reading, and that sequential visual-motor skills, developed as described in Visual Motor Development, do not significantly affect the reading achievement of remedial reading pupils.

TABLE I. AGE, SEX, GRADE, AND IQ SCORE FOR SUBJECTS IN THE X (EXPERIMENTAL) GROUP

Subject	Age*	Sex**	Grade	IQ
5	84	1	1	110
6	77	1	1	104
7	75	1	1	96
8	87	1	2	107
9	89	1	2	99
10	89	1	2	96
12	91	2	2	81
14	87	1	2	97
15	89	1	2	87
18	87	1	3	85
19	107	1	3	83
22	90	2	3	104
24	107	2	3	93
26	94	1	3	89
27	108	2	3	104
29	99	1	3	101
30	117	2	4	85
32	111	2	4	94
34	118	2	4	100
35	123	1	5	101
37	127	1	5	104
39	132	2	5	82
41	135	1	5	72
43	140	1	6	76
44	127	1	6	98
49	143	2	6	80
Mean	105.81			93.30
SD	21.49			12.23

*Age in Months
**Sex. 1 = male
2 = female

TABLE II. AGE, SEX, GRADE AND IQ SCORE FOR SUBJECTS IN THE Y (CONTROL) GROUP

Subject	Age*	Sex**	Grade	IQ
1	81	1	1	79
2	84	2	1	100
3	75	1	1	82
4	76	1	1	87
11	94	1	2	93
13	88	2	2	97
16	93	1	2	96
17	87	2	2	102
20	89	1	3	93
21	86	2	3	81
23	90	2	3	99
25	100	1	3	86
28	102	1	3	104
31	117	1	4	94
33	112	1	4	85
36	120	1	5	93
38	137	1	5	92
40	123	1	5	76
42	140	1	5	95
45	144	1	6	89
46	144	1	6	91
47	147	1	6	91
48	143	1	6	80
50	144	1	6	97
51	145	1	6	88
52	139	1	6	73
Mean	111.50			90.12
SD	26.05			8.09

*Age in months
**Sex, 1 = male
2 = female

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MOTOR COORDINATION RATING SCALE

FACTOR	RATING (Good 1 2 3 4 5 Poor)
Standing	
Stands freely	1 2 3 4 5
Stands relaxed but straight	1 2 3 4 5
Stands with weight evenly distributed	1 2 3 4 5
Walking	
Walks with head in line, not side-to-side	1 2 3 4 5
Walks with toes forward	1 2 3 4 5
Walks heel-to-toe, not shuffle or toe-to-heel	1 2 3 4 5
Walks with cross cadence	1 2 3 4 5
Walks with free-swinging movement and grace	1 2 3 4 5
Hopping	
Hops lightly, gracefully	1 2 3 4 5
Hops equally well on one foot or two	1 2 3 4 5
Hops on either foot equally well.	1 2 3 4 5
Hops on both feet, with feet together	1 2 3 4 5
Hops with reciprocal action between arms & legs	1 2 3 4 5
Jumping	
Jumps with both feet, not in a gallop	1 2 3 4 5
Jumps with rhythm	1 2 3 4 5
Jumps with top & bottom of body coordinated	1 2 3 4 5
Sitting	
Sits with erect but relaxed posture	1 2 3 4 5
Sits with feet flat, straight ahead	1 2 3 4 5
Throwing	
Throws ball underhand	1 2 3 4 5
Throws ball overhand.	1 2 3 4 5
Throws with follow-through of body.	1 2 3 4 5
Throws accurately at target	1 2 3 4 5
Catching	
Catches ball accurately	1 2 3 4 5
Catches ball with grace and ease.	1 2 3 4 5
Catches ball with body follow-through	1 2 3 4 5
Imitating	
Imitates unilateral movements	1 2 3 4 5
Imitates bilateral movements.	1 2 3 4 5
Imitates crosslateral movements	1 2 3 4 5
Imitates auditory patterns.	1 2 3 4 5
Imitates visual patterns.	1 2 3 4 5
Writing	
Writes using two hands.	1 2 3 4 5
Writes so that pencil point is visible.	1 2 3 4 5
Writes with eyes & head about 16 inches from pencil & paper	1 2 3 4 5

Pupil _____ Total _____